Chloride threshold for corrosion of reinforcement in concrete

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Abstract: Cement mortar specimens made with three different C3A cements with a steel bar embedded centrally were partially immersed in a 5 percent NaCl solution, and half-cell potentials were monitored. When the potential value reached -270 mV versus saturated calomel electrode (SCE), taken as the threshold potential for the onset of corrosion of the embedded bar, the specimens were taken out and pore solution extracted from the mortar surrounding the bar. The pore solutions were analyzed for Cl- and OH- concentrations and threshold Cl-/OH- ratios computed. The threshold Cl-/OH- ratio seemed to depend on the pore solution pH and was found to vary from 1.28 to 2.0 for a pore solution pH of 13.26 to 13.36. The free (water-soluble) chloride concentration in the pore solution was converted into threshold free chloride and total (acid-soluble) chloride contents. It was found that the threshold free chloride content was 0.22 to 0.29 percent by weight of cement and was independent of the C3A content of the cement. However, the threshold total chloride content was found to depend on the C3A content of the cement and varied from 0.48 to 0.59, 0.73 to 0.85, and 1.01 to 1.20 percent for 2.43, 7.59, and 14 percent C3A cements, respectively.